IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors/Applicants:	
	Ashutosh Joshi, Yuri Kolodny, Itay Kreisel, Yoel Sasson
Serial No.:	10/541,011
Filed:	December 20, 2005
Art Unit:	1795
Examiner:	Edna Wong
For:	ENHANCED GENERATION OF HYDROXYL RADICALS
Attorney Docket:	0-05-106
Attorney:	Roach Brown McCarthy & Gruber
	1920 Liberty Building
	Buffalo, NY 14202

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

DECLARATION UNDER 37 C.F.R. § 1.1 32
OF PROF. DAN MEYERSTEIN

I hereby declare as follows:

1. I am a physical-inorganic chemist and an emeritus full professor at Ben-Gurion University of the Negev, Beer Sheva. I have over 41 years of scientific experience, particularly in the field of radical chemistry and Fenton reactions. I have published over 270 scientific papers in the peer reviewed journals.

2. I have reviewed the Office Actions of 4 May and 5 May, 2009 in this case. I understand that the Examiner cites CS 274995 (CS/995) in combination with US 6,793,903 (Parrish) and Jen et al. ("Determination of Hydroxyl Radicals in an Advanced Oxidation Process with Salicylic Acid Trapping and Liquid Chromatography", J. Chromatography A, Vol. 796 (1998) pp. 283-8) as rendering the technology of the present patent application obvious. The Examiner compares the processes described in CS/995 and in Parrish, mentioning similarities including the presence of UV light, assuming that in the thermal process of Parrish the UV light is present as it is present in the sun light. The Examiner also considers replacing transition metals in the published techniques by magnesium.

3. I have carefully examined the subject patent application, including the whole specification, as well as both patent documents and the article which were combined by the Examiner in her Office Action, and I have compared the techniques disclosed in the cited documents with the technology of the present application. I have the following observations.

4. Parrish describes the heterogeneously catalyzed thermal decomposition of hydrogen peroxide at temperatures from 200°C to 500°C. At these temperatures the black body radiation is far in the infra red region and somewhat in the visible region. The intensity of light at wavelength below 400 nm, i.e. in the UV region, is negligible and clearly cannot affect the observed process. This results from the Planck Law, which states how much light is radiated by the black body at the temperature T and at the wavelength λ (E being energy per time unit, per surface unit, per wavelength unit, c_1 and c_2 being Planck's radiation constants):

$$E = \frac{c_1}{\lambda^5 \cdot e^{\frac{c_2}{\lambda T}} - 1}$$

When integrating the energy firstly over the UV range (λ lower than 400 nm), and secondly over all wavelengths, the ratio of UV light in the energy spectrum will be about 10% UV for the temperature 5800°C (which is the surface temperature of the Sun). In contrast, the same integrations for the temperature 500°C will yield an imperceptible content of the UV light – by many orders lower than 10%.

The maximum wavelength (λ_{max}) in the spectrum moves toward higher values (less energy), as the temperature decreases from 5800°C to 500°C, according to the Wien Displacement Law, which can be written approximately as follows (wavelength being in μm):

$$\lambda_{max} = \frac{3000}{T}$$

When substituting the two temperatures in degrees Kelvin (6073°K and 773°K) into the formula, λ_{max} values of about 0.5 μm and 4 μm are produced, the former of which corresponds to the yellow light from the Sun, and the latter to the infrared radiation of a body heated to 500°C. Moreover, the total radiation power of a body decreases with the forth power of the temperature, according to the Steffan-Boltzmann Law, providing about 3800 times less radiation energy (including eventual UV component) for 500°C than for 5800°C [$(6073/773)^4 = 3809$; for 200°C it would be as high as 27174].

For the above reasons, I would not suspect the participation of UV light in the decomposition of hydrogen peroxide at temperatures from 200°C to 500°C as described in Parrish.

5. In regard to the considered replacement of transition metals with magnesium, I must note that magnesium has a different electronic structure than transition metals, and therefore it is not a catalyst for redox processes, in contrast to , e.g., iron, nickel, and copper. Thus, no inorganic

chemist will assume that magnesium oxide can replace a transition metal oxide in a catalytic process, particularly not in a Fenton type reaction.

6. It should be pointed out that there is no direct relation between the heterogeneously catalyzed thermal decomposition of hydrogen peroxide at temperatures from 200°C to 500°C on solid magnesium oxide (US 6,793,903) and the photochemical decomposition of hydrogen peroxide in the presence of transition metal complexes at ambient temperature (CS 274995). Moreover, I cannot see any direct relation between the processes of the mentioned patent documents and the process of the present invention. I would not have been – and I would not have expected another expert to be – inspired to design the present process after reading the cited two patents and the article. The finding of the present application in regard to the enhancing effects of magnesium oxide on the radical concentration during the photo-decomposition of hydrogen peroxide is new and unexpected.

7. The present technology provides, according to my understanding, a new process, and I believe that the use of magnesium oxide would not have been obvious. Even as an expert, I was quite surprised by the observed effect of suspended magnesium oxide on the radical formation.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made herein on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the subject application or any patent issuing thereon.

Dated: 30.09.09 Dan Meyerstein

DAN MEYERSTEIN

President of the Ariel University Center of Samaria.
Irene Evens Professor of Inorganic Chemistry, Ben- Gurion University.

Curriculum Vitae

Born:	Jerusalem, Israel, 1938, Married to Prof. Naomi Meyerstein, 4 children.
1956-61	The Hebrew University of Jerusalem.
1961	M.Sc. in Physical Chemistry (adviser Prof A. Training).
1961-65	Soreq Nuclear Research Center.
1963-65	Ph.D. studies at the Hebrew University of Jerusalem (adviser Prof. M. Anbar).
1965	Ph.D. in Chemistry.
1965-6	Research Fellow Argonne National Laboratory, Argonne, IL., USA.
1968-	Chemistry Dept. Ben-Gurion University of the Negev, (1968-83 joint appointment with the Nuclear Research Centre Negev).
1968-73	Senior Lecturer.
1973-78	Associate Professor.
1978-	Professor.
1970-71	Coordinator Physical Chemistry Dept. Ben Gurion University of the Negev.
1971(summer)	N.S.F. Research Fellow at Case Western Reserve University Cleveland, Ohio, USA.
1971-74	Consultant Chemistry Division Argonne National Laboratory, Argonne, IL, USA.
1973-77	Director Chemistry Dept. Nuclear Research Centre Negev.
1976(summer)	Visiting Scientist Hahn-Meitner Institute fur Kurn Frosting, Berlin, F.R.G.
1977-78	Visiting Scientist Argonne National Laboratory, Argonne, IL, USA.
1979-89	Library Director, Ben Gurion University of the Negev.
1979(summer)	Visiting Scientist Argonne National Laboratory, Argonne, IL, USA.
1981(summer)	Visiting Scientist Argonne National Laboratory, Argonne, IL, USA.
1983(summer)	Visiting Scientist Argonne National Laboratory, Argonne, IL, USA.
1983-95	Full time employment at Ben-Gurion University of the Negev.
1983-	Consultant Nuclear Research Centre Negev
1985(summer)	Visiting Scientist Brookhaven National Laboratory, NY, USA.
1985- 6	Consultant Netafim, Kibutz Hazerim.
1986-91	Chairman Coal Research Center.
1987(summer)	Visiting Scientist Hiroshima University, Japan.
1988-91	President, Israel Chemical Society.
1990-4	Deputy Rector, Ben-Gurion University of the Negev.
1993	Acting President, Israel Chemical Society.
1995-	President, Ariel University Center of Samaria
1997-8	Consultant Makhteshim Ltd.
1998-2000	Chairman, Israel Society for Oxygen and Free Radical Research.
2000-2002	Secretary Division Inorganic Chemistry, IUPAC
2004-	Professor Emeritus, Ben-Gurion University of the Negev.

Member: Israel Chemical Society, Israel Society for Oxygen and Free Radical Research. American Chemical Society, the Royal Society of Chemistry and the Society for Biological Inorganic Chemistry.

Languages: Hebrew and English fluent, German good (speaking and reading only).

Honors.

1997 Meitner-Humboldt Research Prize
1998 Kolthoff prize

List of Publications

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Absorption Spectra of NO_3^- in Solution.
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Relation between Lyotropic and Spectroscopic Properties of Anions in Solution.
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3) D. Meyerstein and A. Treinin
Charge-Transfer Complexes of Iodine and Inorganic Anions in Solution.
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4) M. Anbar and D. Meyerstein
The Oxidation of Fluoride Ions upon Radiolysis in Dilute Aqueous Solutions.
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and Israel Atomic Energy Commission Report IA-851(1965).

5) M. Anbar and D. Meyerstein
The Interaction of Radiolytically Produced Univalent Transition-Metal Ions with Water.
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6) M. Anbar and D. Meyerstein
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7) M. Anbar and D. Meyerstein
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8) M. Anbar, D. Meyerstein and P. Neta
On the Radiolysis of Alkali Halides in Aqueous Solutions Saturatedwith Nitrous-Oxide.
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9) M. Anbar and D. Meyerstein
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10) M. Anbar and D. Meyerstein
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11) M. Anbar and D. Meyerstein
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12) M. Anbar and D. Meyerstein
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13) M. Anbar, D. Meyerstein and P. Neta

Reactivity of Aromatic Compounds Towards Hydrogen Atoms.
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Reactivity of Aliphatic Compounds towards Bromine and Hydrogen Atoms in Aqueous Solutions.
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H/D Isotope Effects in the Formation of Hydrogen from the Combination of two Radicals in Aqueous Solutions.
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19) D. Meyerstein and W. A. Mulac
Reductions by Monovalent Zinc, Cadmium and Nickel Ions.
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20) J. Rabani and D. Meyerstein
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24) I. Fried and D. Meyerstein
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26) D. Meyerstein and W. A. Mulac
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Inorg. Chem., 9, 1762 (1970)
27) I. Fried and D. Meyerstein
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37) H. Cohen and D. Meyerstein
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38) H. Cohen and D. Meyerstein

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51) J. Lati, J. Koresh and D. Meyerstein
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54) H. Cohen and D. Meyerstein
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55) D. Meyerstein
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J. Chem. Soc. Chem. Comm., 893 (1979).

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Inorg. Chem., 19, 966 (1980).

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